ENERGY WISE PROJECTS

Commands Gain Efficiency by Replacing Steam Systems

Marine Corps Base (MCB) Quantico, Va.
Naval Air Station (NAS) Oceana, Va.
Naval Amphibious Base (NAB) Little Creek, Va.

The Challenge

At MCB Quantico, the steam and condensate piping was in such poor condition that less than 20 percent of the supplied steam returned to the central plant as condensate; heavy steam plumes poured from manholes and vents. This failing system caused substantial energy loss, building damage, water and chemical treatment costs, environmental liability and a mounting deferred-maintenance liability. Fully restoring the heating infrastructure would have required major expenditures.

NAS Oceana wanted to fulfill its energy vision to improve efficiency, operation and maintenance, and reduce consumption. Reducing the overall length of steam distribution by selectively removing buildings from the central steam system—those farthest from the steam plant—would help accomplish this goal.

NAB Little Creek had a similar situation—an inefficient, 50-year-old coal-fired steam plant and several miles of underground steam distribution piping. The base was facing a $9 million expense just to bring the coal-fired plant up to new minimum environmental standards, without making any efficiency improvements. Additionally, due to the high water table, traditional steam piping insulation didn't last long, causing excessive distribution energy loss.

The Solution

MCB Quantico chose to modernize its ailing infrastructure with efficient, decentralized heating plants. In the space of three years, it installed and turned on new heating plants serving 125 buildings totaling 3.5 million square feet and decommissioned its central steam system.

NAS Oceana removed 14 buildings from its central steam heating system, which allowed it to demolish 20,000 linear feet of steam and condensate piping, or 27 percent of the steam distribution system. It installed Ground Source Heat Pump (GSHP) systems in 12 of these buildings and new stand-alone natural gas boilers in two buildings. The project installed GSHP in two additional buildings. One hangar received a heat pump system, but did not receive a well field because it is surrounded by very thick aircraft rated concrete. Instead, a steam-hot water heat exchanger and a cooling tower were installed to provide heating and cooling water for the heat pumps, making it a very unique "hybrid GSHP" system. The project installed 707 tons of GSHP.

NAB Little Creek replaced its central steam plant with a more efficient dual-fuel (fuel oil and natural gas) steam plant. Two people can operate the new plant compared to 12 needed for the old coal-fired plant. Little Creek also replaced part of the underground steam piping that was most prone to water-damaged insulation with new steam piping. The new steam lines have integrated insulation designed to stay intact when water is present in the trench.

The Funding

Each of these projects was funded through an Energy Savings Performance Contract (ESPC). The cost avoidance generated by the projects will be used to pay the contractors over the contract terms. There was no initial financial outlay by the command due to the ESPC financing.

MCB Quantico designated the energy services company Select Energy Services, Inc. as the energy services company (ESCO) to implement a program for installation and maintenance of new boilers and other heating equipment within various buildings. The total ESPC cost, which is paid out of annual utility budget savings, is $31.5 million. This includes construction as well as operations and maintenance over the 23-year contract term.

NAS Oceana funded its project with an ESPC for $8.2 million with Trane as the ESCO. The contract term is 14.5 years.

At NAB Little Creek, a $33 million ESPC with NORESCO replaced the central steam plant and part of the steam distribution system.

The Bottom Line

Energy Reduction

- MCB Quantico—The central plant used an annual average of 500,000 million British thermal units (MBtu) of natural gas and fuel oil; natural gas use has been cut in half.
- NAS Oceana—Annual savings of 57,210 MBtu.
- NAB Little Creek—Annual savings of 96,327 MBtu.

Cost Avoidance

- MCB Quantico avoids more than $3.9 million per year in costs for utilities and operations and maintenance with the decentralized heating system. Taking utility cost escalation into account, the total cost avoidance over the life of the project will exceed $120 million.
- NAS Oceana avoids more than $1 million per year in utility costs using GSHP technology. Equipment warranty and maintenance for the payment term of the contract was included.
- NAB Little Creek avoids $1.6 million in utility costs per year from the steam plant and distribution system replacement project.

Collateral Benefits

- o Cost-efficient.
- o Improves thermal comfort for building occupants.
- o Avoids steam damage to buildings, mold growth and occupant health concerns.
- o Reduces costs for water and chemical treatment.
- o Lessens environmental liability.
- o Reduces overall emissions of air pollutants.
- o Eliminates high maintenance requirements for aging steam system infrastructure.
- o Eliminates steam plumes rising from old equipment.
- o Eliminates unsightly above-ground steam lines or spikes in energy use from flooded underground steam lines during rain storms.
- o Performance is monitored throughout the contract term and guaranteed by the ESCO.

Feedback

"It was estimated that a modernization program would have cost a total of at least $57 million over the next 23 years. Instead, the MCB Quantico project cost $31.5 million and will save more than $120 million in the same amount of time,"
Robert Calloway, P.E., Regional Manager SESI, (about MCB Quantico project).